

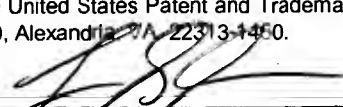


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	<b>TRANSMITTAL LETTER</b> <b>(General - Patent Pending)</b>	Docket No. <b>YOR919990509US2 (13171A)</b>
In Re: Application Of: <b>Cyril Cabral, Jr., et al.</b>		
Serial No. <b>09/994,954</b>	Filing Date <b>November 27, 2001</b>	Examiner <b>Erik J. Kielin</b>
Group Art Unit <b>2813</b>		
Title: <b>METHOD AND STRUCTURE FOR REDUCTION OF CONTACT RESISTANCE OF METAL SILICIDES USING A METAL-GERMANIUM ALLOY</b>		
<p style="text-align: center;"><u>TO THE DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE:</u></p> <p>Transmitted herewith is:</p> <p style="text-align: center;"><b>COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE</b></p> <p>in the above identified application.</p> <p><input checked="" type="checkbox"/> No additional fee is required.</p> <p><input type="checkbox"/> A check in the amount of _____ is attached.</p> <p><input checked="" type="checkbox"/> The Director is hereby authorized to charge and credit Deposit Account No. <b>50-0510/IBM</b> as described below.</p> <p style="margin-left: 40px;"> <input type="checkbox"/> Charge the amount of _____  <input checked="" type="checkbox"/> Credit any overpayment.  <input checked="" type="checkbox"/> Charge any additional fee required. </p> <div style="display: flex; justify-content: space-between; align-items: flex-end; margin-top: 40px;"> <div style="text-align: center;">   Signature </div> <div> Dated: <b>April 14, 2004</b> </div> </div> <div style="margin-top: 20px;"> <b>Leslie S. Szivos, Ph.D.</b>  Registration No. 39,394  <b>SCULLY, SCOTT, MURPHY &amp; PRESSER</b>  400 Garden City Plaza  Garden City, New York 11530  (516) 742-4343  LSS:HAH:kc </div>		
<div style="border: 1px solid black; padding: 5px;"> I certify that this document and fee is being deposited on <b>4/14/04</b> with the U.S. Postal Service as first class mail under 37 C.F.R. 1.8 and is addressed to the Director of the United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. </div> <div style="text-align: center; margin-top: 10px;">   Signature of Person Mailing Correspondence </div> <div style="text-align: center; margin-top: 10px;"> <b>Leslie S. Szivos, Ph.D.</b>  Typed or Printed Name of Person Mailing Correspondence </div>		
CC:		



**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Applicants:** Cyril Cabral, Jr., et al.

**Examiner:** Erik J. Kielin

**Serial No:** 09/994,954

**Art Unit:** 2813

**Filed:** November 27, 2001

**Docket:** YOR919990509US2(13171A)

**For:** **METHOD AND STRUCTURE  
FOR REDUCTION OF  
CONTACT RESISTANCE OF  
METAL SILICIDES USING  
A METAL-GERMANIUM ALLOY**

**Dated:** April 14, 2003

**Confirmation No.:** 3708

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE**

Sir:

In response to the Notice of Allowance issued February 19, 2004, applicants respectfully request that the following remarks be included in the file of the above-identified patent application.

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**CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8(a)**

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on April 14, 2004.

**Dated:** April 14, 2004

  
Leslie S. Szivos, Ph.D.

In response to the Notice of Allowance dated February 19, 2004, applicants respectfully submit the following comments, under 37 C.F.R. §1.312, to clarify the Examiner's statements regarding the patentability of Claim 40. Referring to Page 3, paragraph 2, of the Notice of Allowance, the Examiner states that Claim 40 is allowable because the prior art does not teach or suggest, in combination with the other claimed limitations, that "said substrate and said first layer are separated by a Si-Ge interlayer positioned on an interface between said first layer and said substrate, wherein said Si-Ge interlayer does not substantially extend beyond said interface." The Examiner further notes that the applicants have indicated that Ge may diffuse into the substrate. The Examiner then continues to allege that "if such diffusion does, in fact, occur then the instant claim is, in fact invalid because the Si-Ge interlayer would in fact extend beyond the interface formed between the silicide and the substrate." Applicants respectfully disagree and submit the following comments to clarify the diffusion of Ge in the formation of the Si-Ge interlayer.

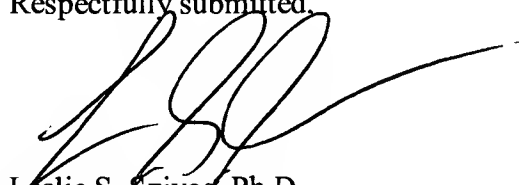
Applicants submit that Claim 40 recites that the Si-Ge interlayer does not *substantially* extend beyond the interface between the first layer and the substrate. Applicants disclose annealing parameters that produce the inventive SiGe interlayer positioned on the interface between the metal disilicide and the underlying Si substrate, where the SiGe interlayer does not *substantially* extend beyond the interface. *See* Page 6 of applicants' Response dated November 10, 2003. Referring to Page 12, paragraph 2, of the applicants' specification, applicants disclose that, "to form the silicide layer and the Si-Ge interlayer in the structure, annealing is carried out using a rapid thermal anneal process using

a gas atmosphere, e.g., He, Ar, Ne or forming gas, at a temperature of about 400°C to about 700°C for a time period of about 300 seconds or less using a continuous heating regime or a ramp and soak heating regime.” See Pages 8-9 of applicants’ Response dated November 10, 2003. The disclosed annealing temperature range provides enough thermal energy to produce the SiGe interlayer by diffusing Ge to the interface between the metal silicide and the substrate; but does not provide enough energy to diffuse Ge uniformly into the substrate in a manner that would produce a SiGe interlayer that substantially extends beyond the interface. See Pages 8-9 of applicants’ Response dated November 10, 2003. Applicants note that although some Ge diffuses into the substrate, the disclosed annealing process allows for the formation of a SiGe interlayer that does not *substantially* extend beyond the metal disilicide/Si substrate interface on which it the SiGe interlayer was formed.

Referring now to FIG. 4 of the applicants’ specification, a TEM of the disilicide film formed by the applicants’ process depicts a SiGe interlayer at the metal disilicide/Si substrate interface, in which the SiGe interlayer has a thickness of less than about 3.0 nm. The TEM depicted in FIG. 4 clearly indicates that the SiGe interlayer does not *substantially* extend beyond the interface on which it was formed. See Page 6 of applicants’ Response dated November 10, 2003. Although some Ge may diffuse into the substrate, the forming process disclosed by the applicants’ *does not provide enough energy to diffuse Ge uniformly into the substrate in a manner that would produce a SiGe interlayer that substantially extends beyond the interface.* Therefore, the inventive SiGe interlayer can be

maintained with some diffusion of Ge into the substrate, so long as the forming process does not provide enough thermal energy to diffuse Ge uniformly into the substrate.

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'LS Szivos', written over the typed name.

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